Centre for
Resource Studies

Queen's University
Kingston, Ontario

Annual Report for the Period 1 May 1987 – 30 April 1988

Centre for Resource Studies

Origins and Objectives

The Centre is a cooperative research institute established at Queen's University in 1973. Funded by The Mining Association of Canada and the federal Department of Energy, Mines and Resources, and co-sponsored by Queen's University, its function is to improve understanding of the complex questions underlying issues of mineral resource policy (excluding oil and gas). The purposes of the Centre are accomplished through a program of research and publication, and by providing opportunities for liaison between representatives of federal and provincial governments, the industry, labour, universities and other interested groups.

Summary of Activities 1975-88

In 1975, a multi-disciplinary research program was launched on the national impact of mining, to study the effects of the mining industry on the economy and on other aspects of Canadian society. This program was completed in 1978. Late in 1976 a second major research thrust was undertaken, with the objective of examining the mineral-related policies and programs of the federal and provincial jurisdictions in Canada. Studies arising from both programs have been published as monographs and working papers, the first appearing in 1976. As of April 1988, twenty monographs and forty-two working papers have been published on these and other topics. In 1981 a new series of publications entitled Technical Papers was introduced, and seven in this series have been published so far. In addition, twenty-eight issues of CRS *Perspectives* have been distributed to our mailing list which now has approximately 4,500 names.

In 1977 the Centre held the first of a series of CRS Policy Discussion Seminars. Each seminar brings together, in a constructive working environment, invited representatives of a diversity of interests to discuss a topic of current policy concern. Each gives rise to a set of proceedings which contains the text of papers presented at the seminar, as well as a digest of discussions. Eighteen seminars have been held up to April 1988.

Further details of CRS activities may be found in later sections of this report. The Executive Director and Board of Directors wish to acknowledge the contribution of CRS staff, associates, and committee members. Without their strenous efforts and generous allocation and time, the accomplishments of the past year would not have been possible. Further details of CRS activities may be found in later sections of this report.

1987-88 Activities of the Centre

The Centre continued to focus on international trade and the competitive position of the Canadian mineral industry in 1987-88. Completed studies explored the potential for exports of Canadian minerals to the Republic of South Korea and Canadian foreign policy with respect to markets and marketing arrangements for mineral exports. Studies carried on from last year include Margaret Slade's examination of the mechanisms of commodity exchanges and producer pricing, David Haglund's comparative assessment of U.S. protectionist pressure in copper, potash and uranium, and Carmine Nappi's study of long-run structural changes in demand for several key metals. David Anderson continues his work on Pacific Rim coal-trade issues with two studies: an economic analysis of Western Canadian export coal supply and a joint project with Don Barnett comparing Australian and Canadian export coal. International trade issues were also very much in evidence at the 1987 CRS Policy Discussion Seminar "Prospects for Minerals in the 90s".

CRS will continue its work in the area of international trade, but also plans to concentrate some of its attention on regional development issues. A new project which reflects this new research focus is "Evolution of the Manufacturing Component of the Ontario Mining Industry". This study will be carried out by Alan Green of the Department of Economics at Queen's University and is funded by the Ontario Ministry of Northern Development and Mines.

The Centre's core staff pursued their long-term research and data collection activities in mineral economic and mineral policy fields, while also carrying out shorter-term projects of current interest. Dr. Mackenzie, Mr. Doggett, and Dr. Bilodeau completed mineral economic studies for the governments of Newfoundland and Ontario. They also continued expanding and updating their data base of Canadian mineral deposits and related computer modelling capability. Dr. Anderson completed his quantitative study comparing the impact of mining on the Canadian economy with other resource sectors. Mrs. Wojciechowski travelled extensively this year gathering information for her work on funding for mineral-related research and education in the earth sciences and the mineral sector. She also continued to follow federal and provincial initiatives affecting the mineral sector. External researchers covered both international and Canadian-based issues including gold exploration and mine development in Quebec, tax reform, and structural changes in the mineral industry. Project-by-project information is provided in the following section.

CRS will undergo major administrative changes in 1988-89. Dr. Anderson has resigned as Executive Director as of 30 April 1988 to accept the position of Dean of the School of Business at Queen's University. A new executive director will probably be appointed by the Principal of the university within the year. Margot Wojciechowski will serve as Interim Executive Director until a successor to Dr. Anderson is chosen. The Board of Directors is very grateful to Dr. Anderson for his four years of service to CRS. During his term the Centre has consolidated its financial situation and revitalized its research program. The Board congratulates him on his new position and wishes him continued success in the future.

In addition, CRS is scheduled to move into the new School of Policy Studies building early in 1989. The Centre for Resource Studies will share the building with the other policy-oriented institutes and schools which heretofore had been housed in various locations around the campus. The new School of Policy Studies will provide more opportunity for collaboration among its constituents and should enhance policy research at Queen's in general.

Research Completed Since May 1987

Research Funded by CRS

Quantitative Assessment of the Economic Impact of Mining on the Canadian Economy, David L. Anderson, Centre for Resource Studies. This study drew on existing data sources (primarily computer data bases) to demonstrate the impact of mining on Canada's economy, especially in comparison with other resource industries such as forestry and petroleum. The results of this study are in the process of being prepared for publication.

Productivity in the Canadian Mineral Industry, Frank Anton, University of Calgary. This researcher was awarded a grant-in-aid of research to revise and update a study of "Productivity in the Canadian Mineral Industry" undertaken for Energy, Mines and Resources Canada in 1973-74. Two productivity models were compared and analyzed, and the policy implications for government and industry were considered. No publication resulted from this project.

Flow-Through Share Financing, Basil A. Kalymon, Faculty of Management Studies, University of Toronto. This project updated previous studies with regard to the level of activity in flow-through financing, documenting the alternative mechanisms available, and analyzing the investment incentives created by flow-through shares. The researcher drew conclucions as to the future potential and limitations of flow-through financing. This study was published as a CRS working paper.

Exploration of the Korean Market for Canadian Minerals, Yul Kwon, University of Regina. In this study, Dr. Kwon investigated the trade opportunities available to Canada in the rapidly expanding industrial economy of South Korea. With the prospect of static markets for Canadian minerals in the USA, EEC, and Japan, Canada must investigate new trade opportunities. It is expected that South Korea, whose economy has grown at a rate of 8 percent per annum over the last 20 years, will be the "Japan" of the future. This study was published as a CRS monograph.

Economic Comparisons of Base Metal Exploration in Australia and Canada, Brian Mackenzie, Centre for Resource Studies, and Roy Woodall, Western Mining Corporation. This study compared the economics of base metal exploration in Australia during the period 1955-78 with similar assessments made in Canada for the 1946-77 period. The comparison was based on documented historical experience, evaluated in the context of current economic outlook conditions. Mineral exploration economics are measured by the relationship between real exploration expenditures, and the value of economic deposits discovered as the result of that exploration. This study was published as a CRS working paper.

The Changing Transportation Environment of the Canadian Mineral Industry, Iain Wallace, Carleton University. This study investigated and analyzed critical issues in Canadian mineral transportation. Data and documentary material were gathered from shippers, carriers, government and industry spokesmen, and relevant agencies. Where appropriate, the study quantified and projected trends. This study was published as a CRS working paper.

Canadian Policy Toward Instability in International Mineral Markets, Mark W. Zacher and Michael C. Webb, University of British Columbia. The primary objective of this study was to describe and explain Canadian foreign policies for dealing with instability in the markets of minerals that Canada exports and to evaluate their desirability and feasibility for Canada. A secondary objective was to analyze Canadian policies regarding international arrangements for a number of mineral and agricultural commodities that Canada imports. Particular attention was given to international market conditions, the interests of Canadian producers and consumers, and the policies of other producing and consuming states. The study encompassed eight minerals that Canada exports: copper, iron ore, lead, nickel, potash, tungsten, uranium, and zinc. This study

was published as a CRS monograph entitled "Canadian and International Mineral Markets: Dependence, Instability and Foreign Policy".

Research in Progress

Research Funded by CRS

Economic Analysis of Western Canadian Export Coal Supply, David L. Anderson, Centre for Resource Studies. This study will examine the economic structure of the western Canadian export coal industry. It will address the merits of the industry's rapid development since 1960, especially in the post-1980 period. In this regard, particular attention will be placed on the debate surrounding the northeast British Columbia coal project. The study will also describe and assess the problems currently facing export coal producers and outline the industry's future prospects.

Australian and Canadian Export Coal: A Policy Analysis of Relative Competitiveness, David L. Anderson, Centre for Resource Studies; and Donald W. Barnett, Macquarie University, Australia. The objective of this study is to assess the relative competitiveness of Australian and Canadian export coals in the Pacific Rim market. The analysis focuses on the domestic cost structure of each industry with special attention given to operating costs, non-profit and profit-based taxes, domestic transportation levies, and infrastructure financing arrangements.

Economics of Gold Exploration and Mine Development in Quebec, Michel Bilodeau, McGill University. This study focuses on the compilation of a comprehensive data base on significant gold deposits located in Quebec. It is an extension of the base metal data base compiled by the researcher and B.W. Mackenzie of CRS. In the first phase of the study, actual data will be compiled on a deposit-by-deposit basis assuming present-day economic and technological conditions. The second phase consists of refining and adapting the generalized costing relationships in the economic evaluation model which is used in conjunction with the base metal deposit data. The third phase consists of the preliminary analysis of the data base, given current gold price forecasts. Finally, the economics of gold exploration in Quebec will be examined by combining this information with the total gold exploration expenditures compiled for the same time period.

Evaluating the Restructuring Strategies of Canadian Mining Firms in the Recession 1977-1985, John Bradbury, McGill University. This project will evaluate the restructuring and winding-down strategies deployed by mining companies during the period 1977-79 through to 1985-86. A mail survey of a sample of mining companies in eight different mining regions and sectors will ascertain strategies during this period of crisis in the industry. Data sets in Statistics Canada on overall expenditures by mining type and general data sets available at EMR in Ottawa on investments in different aspects of mining will be reviewed. These two data sets will be compared as well as the corporate responses across Canada in eight different mineral types.

An Assessment of the Effects of Countertrade on the Canadian Mining Industry, Andrew F. Cooper, University of Waterloo. During the 1980s there has been a marked increase in the number of countries actively promoting countertrade as a means of conducting international transactions. This project will study the impact of countertrade on the Canadian mining industry and assess the extent of Canadian involvement in techniques which fall into this category. The researcher will first provide an overview of the nature and scope of countertrade in the international mining industry, then focus on the impact of global countertrade on Canadian policy and practice, and finally, assess the involvement of Canadian mining companies (and others whose activities might have a bearing on the mining industry) in countertrade. The author's manuscript is in the review process.

The Challenge to Canadian Mineral Exports to the USA: A Comparative Assessment of Protectionist Pressure in Copper, Potash, and Uranium, David G. Haglund, Centre for International Relations, Queen's University. This study will explore the extent to which Canadian export interests in three commodities - copper, potash, and uranium - are or may be affected by the apparent

increase in U.S. Congressional sentiment for protectionism. The author began to examine the protectionist challenge as part of a broader research project on "Canadian Interests and U.S. Mineral Policy" with the assistance of a CRS grant-in-aid in 1984. The proposed research will develop further some of the issues examined in the earlier study and extend the scope of the inquiry to include copper and potash. Several journal articles and a book, *The New Geopolitics of Minerals: Canada and the International Resource Trade* (published by UBC Press), have resulted from Dr. Haglund's research thus far.

Economic Analysis of Canadian Gold Supply, Brian Mackenzie and Michael Doggett, Centre for Resource Studies. A comprehensive mineral deposit data base is being assembled, documenting short-, medium-, and long-term aspects of Canadian gold supply, concentrating on trends during the 1946-84 period. This information is being organized on micro-computer spreadsheets for evaluation and analysis. The plan is to integrate this work with the economic evaluation procedures and base metal data base which has been developed at CRS since 1975. A paper on gold exploration economics, arising from this research, was published as "Economic Guidelines for Gold Exploration in the Western Canadian Shield" in *Gold in the Western Shield*, ed. L.A. Clark, Special Volume 38, CIMM, Montreal, 1986. Two papers were prepared for the CRS policy workshop on Long-Term Prospects for Gold Mining. One was published as CRS Working Paper No. 41: *Economic Trends in Canadian Gold Supply*. The other, "Long-Term Breakeven Price for Canadian Gold Supply" (with Donald Cranstone) was published as part of CRS Proceedings 20. The data base is currently being used for the externally funded contracts with the Ontario Ministry of Northern Development and Mines, and the Newfoundland Department of Mines and Energy. (These projects are described elsewhere in this exhibit.) This research has also resulted in a paper to be presented at *Bicentennial Gold 88* in Melbourne, May 1988. In October 1988, the researchers will act as principal session leaders in the "Gold Deposits Evaluation" seminar to be held at the Helsinki University of Technology.

Size and Grade Characteristics of Base Metal Deposits in Canada, Brian Mackenzie, Centre for Resource Studies and Duc Le, former graduate student, Department of Geological Sciences. This study examines the tonnage and gross in-situ value per tonne characteristics of base metal deposits, utilizing data for 275 deposits discovered in Canada to 1977. The actual distributions of these endowment characteristics, their relationship to the lognormal statistical model, and the relationship between deposit size and grade are analyzed for various types of base metal deposit. Illustrations are provided of how the results can be applied to government policy and corporate planning issues. A master's thesis was completed in 1983. A summary paper was presented at the CIM annual meeting in April 1984. The study will be prepared for publication as a CRS technical paper.

Economic Comparison of Mineral Supply Potential in Northern and Southern Canada, Brian Mackenzie and Leo Verleun, Centre for Resource Studies. This study compares endowment and locational characteristics of exploration and mining in the northern territories with those of the more-accessible southern provinces. The first stage of the study was completed under contract to Indian Affairs and Northern Development Canada in March 1984. A more thorough analysis was subsequently carried out in Leo Verleun's masters thesis, completed in late 1984. This work has been further extended and a manuscript is currently being prepared for publication.

Federal and Provincial Taxation of Resource Industries: Impact and Implications for Reform, Jack Mintz and Robin Boadway, Queen's University. The purpose of this study is to describe and assess how corporate and provincial mining taxes influence the investment decisions and production structure of Canadian mining firms. While earlier literature tried to evaluate the effect of taxation by measuring the average tax rate, this study measures the "effective" tax rate (the tax imposed on the marginal project). In addition to providing an analysis of the impact of taxes on mining firms, the researchers will propose measures for tax reform based on their findings.

Metals Demand and the Canadian Mineral and Metal Industry: Structural Changes and Policy Implications, Carmine Nappi, University of Montreal. The objectives of this work are: to examine the extent to which there is a long-run structural change in the Western economies demand for aluminum, copper, lead, nickel and zinc; to explain that change in assessing the relative importance of the income effect and the conservation-structural effect; to evaluate the implications of structural changes in metals demand on market structure, on firms' pricing and R&D; and finally to study its possible effects on the formulation of a mineral policy for Canada and its province.

The Impact of State-Owned or State-Assisted Mines and Smelters on International Markets, Ciaran O'Faircheallaigh, Australian National University. This study will examine the implications for producers in "free market" situations (i.e. in Canada and Australia) of competing with producers whose input costs and/or output levels are influenced by noncommercial criteria. The researcher will concentrate mainly on copper, iron ore, and aluminum. He visited CRS for three months in 1986 to collect data and conduct interviews on the Canadian situation.

The USSR's Mineral Policy and its Implications for Canada, Miron Rezun, Bishop's University. This study will examine the extent to which Canadian mineral interests are, or could be, affected either negatively or positively by Soviet mineral policy. Secondly, it will outline plans, policies, or proposals the USSR has been, or might be, considering in a possible "resource war" that could affect Canada.

The Impact of Alternative Pricing Systems on the Canadian Mineral Producers, Margaret Slade, University of British Columbia. There are a multitude of unresolved issues concerning the mechanisms of commodity exchanges and producer pricing. This study is a first step in the determination of whether commodity exchanges fairly determine the price of metals and should therefore be supported. Through interviews and library research the researcher will focus on the way a particular commodity is sold and the specific institutional arrangements which distinguish this market from others. A statistical analysis of pricing and production trends will attempt to uncover general trends and similarities across commodities. Where pricing patterns are very different, an attempt will be made to discover why. A manuscript is now being prepared for publication.

Mineral Policy Update, Margot Wojciechowski, Centre for Resource Studies. This study monitors mineral policy and program changes made by the federal government, the territories, and the provinces.

Alternative Models for Industry-Government Relationships in Mining, David Yudelman, Centre for Resource Studies. This study will examine the relationship of government and the mining industry in Australia and South Africa. Special reference will be made to the relevance (if any) for Canada of the Australian and South African models.

Business-Government Relations in Mining, David Yudelman, Centre for Resource Studies. This study will be a review of the literature on the relationship between business and government, with a primary focus on mining.

Externally-Funded Research

Evolution of the Manufacturing Components in the Ontario Metal Mining Industry, Alan Green, Department of Economics, Queen's University. This study, funded by a grant from the Ontario Ministry of Northern Development and Mines, will study the evolution of the manufacturing component of mining production in the province of Ontario. This work is seen as part of the general review of the Ontario Mining Act, and in particular with the requirements for Domestic Processing set out in Section 104 of this act. The study will examine the extent of domestic processing by specific metal, i.e. copper, nickel, gold, iron ore, etc. The analytical focus of this exercise is to examine the extent of Value Added Growth by particular metal groups over time.

Mine Discovery and Development in Ontario: Economic Guidelines for Government Policy, Brian W. Mackenzie, Centre for Resource Studies and Michel Bilodeau, McGill University. The objective of this research is to provide support for policy and planning within the Ministry of Northern Development and Mines. This will be accomplished by developing a deposit-specific data base and evaluation procedure for assessing the potential for discovering and developing metallic mineral deposits in Ontario. The project will update and extend an existing base metal data base; assess the economic characteristics associated with discovering and developing base metal deposits in Ontario; illustrate how this type of assessment can be used to evaluate government policy effects; and carry out a preliminary economic appraisal of the discovery and development of gold deposits in Ontario. A draft report has been submitted.

Assessing the Impact of Alternative Types of Regional Development Policy on the Economics of Base Metal and Gold Mining in Newfoundland, Brian Mackenzie, Michael Doggett, Centre for Resource Studies, and Michel Bilodeau, McGill University. The objective of this study is to gain an improved understanding of the economic impact of alternative types of regional development policy on base metal and gold exploration, development and productions in Newfoundland and Labrador. By developing a deposit-specific data base and evaluation procedure for assessing the economics of base metal and gold exploration, development and production in Newfoundland and Labrador, the study will provide support for policy and planning. The impact of alternative types of regional development policy will be evaluated, compared, and applied to the mineral supply assessments. This comparison and evaluation will use measures of policy efficiency, government revenue effects, and private investment incentive. A draft report has been submitted.

Comparative Study of Mineral-Related Research and Development Funding, Margot J. Wojciechowski, Centre for Resource Studies. This study will identify sources and mechanisms of mineral-related R&D funding and performance in Canada and compare them to the situation in other Canadian resource sectors. For comparative purposes, the study will also consider mineral R&D funding and performance in Australia, Finland, France, Sweden, West Germany, United Kingdom and the United States. The implications of special circumstances and conditions with respect to the role and organization of the mineral industry and its R&D support in the various countries will be discussed.

Trends in R&D Funding and Education in Earth Sciences, Margot J. Wojciechowski, Centre for Resource Studies. The Geoscience Council of Canada has commissioned a comparative study of R&D funding and education in the earth sciences in Canada and in a number of other mineral-producing countries. The study also looks at the economic contribution of earth sciences to the mineral industry, particularly to the mineral exploration sector. A draft of the Canadian section of the report has been submitted.

New Publications

The following new publications arising from the CRS research and seminar programs were released during 1987-88.

Flow-Through Share Financing, by Basil Kalymon, was published in May 1987. This working paper analyzes the impact and rationale for flow-through share financing. It is based on data collected on the level and nature of such activity on the three principal Canadian stock exchanges, and draws on the most recent surveyes conducted by Energy, Mines and Resources as well as on industry statistics and interviews.

Mineral Exploration Economics: The Search for Base Metals in Australia and Canada, by Brian Mackenzie and Roy Woodall, was published in September 1987. This is number 40 in the CRS series of working papers. This study examines the similarities and differences between base metal economics in Australia and Canada. It considers possible reasons for the marked differences observed in discovery costs, and expected value of exploration and the average size of deposits discovered in Australia and Canada.

Economic Trends in Canadian Gold Supply, by Brian Mackenzie and Michael Doggett, was published as CRS working paper no. 41 in October 1987. It examines economic trends in Canadian gold supply, focusing on the forty-year period 1946-85. The big picture which emerges from the analysis of these specific trends is that of a long economic cycle, having a duration of about fifty years. The Canadian trends analyzed in the paper are part of a worldwide phenomenon.

The Changing Transportation Environment of the Canadian Mineral Industry, by Iain Wallace, was published as CRS working paper no. 42 in November 1987. The turbulent economic environment of the 1980s has stimulated major western antions to reduce public sector intervention in domestic economic activity. The results of this trend are most noticeable in sectors traditionally most subject to state regulation such as transportation. The combined forces of fiscal pressure and of the impact on Canada of deregulation within the transportation sector of the United States have prompted major changes to national transportation policies during this decade. This study examines these changes and their effect on the Canadian mineral industry.

Long-Term Prospects for Gold Mining, edited by Brian Mackenzie and Renka Gesing, was published in September 1987. It contains the proceedings of a policy discussion workshop convened by the Centre for Resource Studies in October 1986 to examine the key determinants of the investment and growth in primary gold supply. The purpose of the workshop was to discuss and define what we need to know to better understand the economic environment for exploration, development, and production which will prevail to the turn of the century and beyond.

The Korean Mineral Market: Opportunities and Marketing Strategies for Canada, by O. Yul Kwon, was published in November 1987. It is no. 19 in the CRS monograph series and examines the potential for increasing Canadian mineral exports to the Republic of South Korea. It points out the high complementarity between the Canadian and Korean economies and details Korea's procurement policies for coal, uranium, and potash, while offering concrete suggestions for improving Canada/ Korean economic relations.

Canada and International Mineral Markets: Dependence, Instability, and Foreign Policy, by Michael Webb with Market Zacher, was published in February 1988. The primary objective of this study is to describe Canadian foreign policies for reducing instability in the markets for minerals that Canada exports and to explain how economic and political considerations have intereacted to shape Canadian policy. Eight export minerals that have been the subject of international stabilization efforts are included in the study: copper, iron ore, lead, nickel, potash, tungsten, uranium, and zinc. A chapter on tin is also included because of this metal's historical significance in the area of international commodity arrangements.

A complete list of CRS publications appears at the end of this report.

Publications Outside CRS by CRS Researchers

David Anderson, "Innovation in Public Rent Capture: The Saskatchewan Uranium Industry", *Resource Rents and Public Policy in Western Canada*, eds., Thomas Gunton and John Richards (Montreal: Institute for Research on Public Policy, 1987).

David Anderson, "Inter-Provincial Competition and the Canadian Potash Industry", *Selected Readings in Mineral Economics*, F.W. Anderson (Toronto: Pergamon Press, 1987).

David Anderson, "The Canadian Mineral Industry: Market Access and the Subsidy Debate", *Raw Materials Report*, 5(3): 36-43, 1987.

David Anderson, "Capacity Stimulation Policies: A Possible Explanation for Excess Capacity in the Coal Industry", *Journal of Business Administration*, forthcoming.

David Anderson, "Implications of the Canada-USA Free Trade Agreement for the Canadian Minerals Industry", *Resources Policy*, forthcoming.

David Anderson, "The Centre for Resource Studies: A Business/Government/University Venture", in *University Research Centres in the Social Sciences and Humanities* (Ottawa: University of Ottawa Press, 1987).

Brian Mackenzie, "Mineral Exploration Productivity: Focusing to Restore Profitability", pp. 79-102 in *Selected Readings in Mineral Economics*, F.J. Anderson eds., Pergamon Press, New York, 1987, 399 pp. (reprint)

Brian Mackenzie, "Looking for the Improbable Needle in a Haystack: the Economics of Base Metal Exploration in Canada", pp. 39-62 in *Selected Readings in Mineral Economics*, F.J. Anderson ed., Pergamon Press, New York, 1987, 399 pp. (reprint)

Brian Mackenzie, "Economic Comparison of Mineral Exploration and Acquisition Strategies to Obtain Ore Reserves", with R.L. Robinson, pp. 279-300 in volume 3, *APCOM 87*, Proceedings of the 20th International Symposium on the Application of Computers and Mathematics in the Mineral Industries, The South African Institute of Mining and Metallurgy, Johannesburg, 1987.

Presentations Made by CRS Researchers and Associates

(Based on CRS-related work)

David Anderson:

"Excess Capacity in the Coking Coal Industry: Possible Explanations", Annual General Meeting of the Canadian Institute of Mining and Metallurgy, Toronto, May 1987.

"The Centre for Resource Studies and Mineral Economic Research", Bureau of Agriculture and Resource Economics, Canberra, Australia, 24 November 1987.

"The Long-run Viability of the Northeastern British Columbia Coal Project: Current Issues", East-West Centre, Honolulu, Hawaii, 25 November 1987.

(with Terry Bennett) "Instability in Mineral Commodity Markets", a paper presented at a conference on Unstable Commodity Markets: Incomes, Jobs, and Public Policy, Calgary, Alberta, 13 April 1988.

Canadian Institute of Resources Law, Trading Canada's Natural Resources, Banff, 6-9 May 1987 (discussant).

Learned Societies Meeting, Canadian Political Science Association, Hamilton, 7 June 1987 (chair, session on Resources Policy).

Pacific Economic Cooperation Committee, Minerals and Metals Forum, Seoul, Republic of Korea, 28-30 October 1987 (member of Canadian delegation, discussant, chairperson of a session).

Brian Mackenzie:

"Mineral Economics: Decision-Making Methods and the Mineral Industry", two-week course, Australian Mineral Foundation, Adelaide, June 1987.

"Mineral Exploration Strategies", ABRAMO-Associacao Brasileira dos Mineradores de Ouro, Rio de Janeiro, May 1987 (one-day seminar).

"Economic Guidelines for Gold Exploration", ABRAMO-Associacao dos Mineradores de Ouro, Itapava, Brazil, May 1987 (one-week seminar).

"Application of Mineral Economics to Exploration, Evaluation and Development", Institute of Geology and Mineral Exploration, Athens, August 1987 (one-week seminar).

"Mineral Exploration Economics: Focusing to Encourage Success", paper presented at Exploration '87, Third Decennial International Conference on Geophysical and Geochemical Exploration for Minerals and Groundwater, Toronto, September 1987.

"Economic Comparison of Mineral Exploration and Acquisition Strategies to Obtain Ore Reserves", paper presented at APCOM 87, 20th International Symposium on the Application of Computers and Mathematics in the Mineral Industries, Johannesburg, October 1987.

"Economic Guidelines for Exploration Planning", Queen's University, December 6-12, 1987.

Principal lecturer, professional development seminar on "Mineral Project Evaluation Techniques and Applications", McGill University, April 18-29, 1988.

Margot Wojciechowski

(with David Anderson) Short course in Resource Communities/Regional Development, School of Public Administration, Queen's University, Kingston, 11-22 May 1987.

"Canadian Mineral Policy: Using the Private Sector to Achieve Public Policy Goals", Institute of Economics, University of Mining and Metallurgy (AGH) Krakow, Poland, 27 June 1987.

"Challenges in Technology in Canadian Mining", Cirque '88, Conference on Industry and Resources, Queen's University Engineering, Kingston, 21 January 1988.

CRS Policy Discussion Seminars

The CRS Policy Discussion Seminars are designed to bring together senior individuals from federal and provincial governments, corporations, universities, trade unions, and other interested groups to discuss current mineral policy issues. The informal atmosphere is conducive to the free and constructive exchange of views. In a typical two-day session, six or eight speakers present background information and views on the issue. Subsequent discussion in small groups and open sessions allow the participants to develop a mutual understanding of the problem and of other viewpoints, and to discuss potential solutions. The proceedings are published, including the papers and some analysis and conclusions.

Prospects for Minerals in the '90s

In October 1987, the eighteen CRS Policy Discussion Seminar on Prospects for Minerals in the '90s was held at Queen's University. It brought together an interdisciplinary group of 40 planners, executives, and researchers from senior levels in the mining industry, government and university. The purpose of the seminar was to discuss the new business environment in which the minerals industries operate, focusing on the following specific challenges: future demand and supply patterns for major minerals: trade and access to markets; new competition from engineered materials; safety and occupational health. The following papers were presented.

Future Challenges Facing the Canadian Minerals Industry: a Private Sector View, by Norman Keevil
Emerging Trends in World Mineral Competition, by John MacLeod
Emerging Issues in Mineral Trade, by John Cordes
World Supply - Demand Patterns in the 1990s, by Simon Hunt
Prospects for Candian Mineral Endowment, by Jan Zwartendyk
Canada's Future Position as a Mineral Producer: Government Perspectives, Pierre Perron
Emerging Competition: The New Materials, by Peter McGeer
Quality of Working Life: The Challenge of Occupational Health and Safety, by Beverly Harris and Albert Cecutti

CRS Perspectives

Two issues of CRS *Perspectives* were published during the current year. *Perspectives* is an occasional bulletin edited by Margot Wojciechowski that contains comments about the Canadian mineral industry, reviews, and news of CRS activities and publications. *Perspectives* is sent to the entire CRS mailing list of about 4,500 individuals and institutions interested in mineral policy issues.

The June 1987 issue featured an article by Debra P. Steger of Fraser and Beatty entitled "Free Trade and the Mining Industry". As well, this issue provided a list of current projects undertaken by external researchers who are supported by contracts and grants-in-aid from CRS. *CRS Perspectives* for December 1987 contained an article entitled "Continuous Technological Improvement in Mining Operations", (David A. Johnson, Wilfrid Laurier University) and a piece by Margot Wojciechowski, "Identifying the Upcoming Issues".

Financial Arrangements

The Centre disbursed $130,247 on administrative activities and $446,774 on research activities during the year.

Continuing financial support is received from The Mining Association of Canada and Energy, Mines and Resources Canada. Funding from The Mining Association of Canada for 1987-88 was $196,000 per year ($78,400 for administration and $117,600 for research). This funding was matched by Energy, Mines and Resources Canada. A total of $31,230 was recovered from the sale of publications and seminar registration fees.

The Centre also seeks to serve the research needs of other agencies. In the current year, research support was received in the amount of $154,340 from agencies other than the Centre's permanent sponsors.

The Board of Directors

The Board consists of sixteen members. The Executive Director and the Advisory Council Chairman are ex-officio members. Of the remainder, four are appointed by The Mining Association of Canada, three by Energy, Mines and Resources Canada, and seven by the Principal of Queen's University. The Chairman is C. George Miller, Managing Director, The Mining Association of Canada. The chairman of the Research Advisory Committee has observer status at Board meetings.

The Board met twice during the year; the spring meeting was held April 14 in Kingston and the fall meeting took place October 22 in Ottawa. On these occasions, the Board discussed a number of ongoing and potential research themes, the recommendations of the Advisory Council, and various administrative and policy matters.

During 1987-88, H. Jamieson retired from the Board, and R. Simeon joined as a new appointee.

Members of the 1986-87 Board of Directors were as follows:

D.L. Anderson
Centre for Resource Studies
C.T. Asplund
Queen's University
J. Beausoleil
Department of Finance
R.W. Boadway
Queen's University
K. Brewer (1987 only)
Energy, Mines and Resources Canada
P. Calder
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M.D. Everell
Energy, Mines and Resources Canada
K.C. Hendrick
Noranda Minerals Inc.
W. James
Falconbridge Limited
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Queen's University
R.J. Keyes (observer)
Energy, Mines and Resources Canada
P.C. MacCulloch
Selco, Division, BP Resources Canada
G. Mahoney (1988 only)
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R. Sully
Energy, Mines and Resources Canada
R.J. Uffen
Queen's University

Advisory Groups

The Advisory Council

The Advisory Council currently has a membership of sixty-four. All researchers associated with the work of the Centre are appointed to membership for the duration of the research or a minimum of one year. Other members, representing governments, industry, labour, the professions, and other interested organizations and groups, are appointed for a three-year term. The functions of the Council are to advise the Board, primarily on the research program, and to act as advisors to the Centre's staff.

The Council's 1987 annual meeting was held on April 15, under the chairmanship of Keith Brewer. Reports on the Centre's ongoing activities were received and discussed, along with presentations by a number of CRS and external researchers. Gilles Mahoney was chosen as chairman of the Council for 1988 and 1989.

Advisory Council members for 1987-88 were as follows.

Appointed Members

*P. Andrews**
Energy, Mines and Resources Canada
W.J. Barbour
Noranda Mines Limited
*K. Brewer** (chairman, 1987)
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J. Carman
Consultant
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Prospectors and Developers Association
J. Lazarovich
Indian and Northern Affairs Canada
G. Mahoney (chairman, 1988)
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W. Marsh
Retired, United Mines Workers of America
*R. Mason**
Queen's University
*G.B. McRae**
B.C. Ministry of Energy, Mines and Petroleum Resources

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Canadian Advanced Technology Association
*D.J. Worth**
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* Also a member of CRS Research Advisory Committee

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Carleton University
M. Webb
University of British Columbia
M.J. Wojciechowski
Centre for Resource Studies
D. Yudelman
Bank of Montreal
M. Zacher
University of British Columbia

The Research Advisory Committee

The Research Advisory Committee was formed in 1976 to advise the Board of Directors and executive director of CRS on research goals and priorities, and on the selection, formulation and direction of research projects. The committee consists of individuals knowledgeable about the mineral industry and research methods, chosen from industry, government, private consulting, and universities. The committee decides on the allocation of grants-in-aid of research and advises on the award of research contracts. In 1981 the committee members all joined the Advisory Council of CRS as well. Under the chairmanship of Robert J. Keyes, the Committee reviewed grant applications and project proposals submitted to the Centre during 1987-88. For a list of members (marked *), see Advisory Council list above.

CRS Personnel

Members of the Centre staff coordinate the program of external research, carry out studies in-house, edit and produce the Centre's publications, organize seminars and meetings, and provide staff services to the Board and Advisory Council. Other related professional activities include participation in conferences and seminars, speaking engagements and teaching, publication of professional writings, and consultation with other researchers.

During 1987-88, the staff and associates of the Centre were as follows:

Core Staff

David L. Anderson, Executive Director
Donna Beaubien, Publications Officer
Terry Bennett, Research Assistant
Sandra Cantelon, Bookkeeper/Secretary (to August 31, 1987)
Michael Doggett, Research Associate
Ann Green, Visiting Research Associate (from March 1, 1988)
Brian W. Mackenzie, Senior Research Associate
Linda Noble, Departmental Assistant (part-time)
Dorothy Smith, Secretary (from September 1, 1987)
Margot Wojciechowski, Associate Director

Faculty Associates

Michel Bilodeau, Department of Mining and Metallurgical Engineering, McGill;
Alan Green, Department of Economics, Queen's University
David Haglund, Department of Political Studies, Queen's University
Nancy Olewiler, Department of Economics, Queen's University
Peter Richardson, School of Business, Queen's University

Part-time Staff

In addition, many others have assisted in the work of the Centre at various times. The contributions of Andrew Currie, Susan Gentleman, Renka Gesing, Holly Lindsay, Janis Michaels, Nathalie Proux, and Jim Stewart are gratefully acknowledged.

Complete Listing of CRS Publications

Following is a complete list of all CRS publications. Publications that are out of print (marked *) can be ordered from Micromedia Limited. All other publications can be ordered from:

Centre for Resource Studies
Queen's University
Kingston, Ontario K7L 3N6
(Telephone: 613-545-2553)
(Fax #: 613-545-6300)

Monographs and Collections

Conflict and its Resolution in the Administration of Mineral Resources in Canada, by R.M. Burns; 62 pages, 11 tables, 1976. (M-1, $5.00)

The Impact of the Mining Industries on the Canadian Economy, by R.W. Boadway and J.M. Treddenick; 116 pages, 15 tables, 1977. (M-2, $9.00)

The Transportation Impact of the Canadian Mining Industry, by A.I. Wallace; 154 pages, 17 tables, 1977. (M-3, $9.00)

Human Resources in Canadian Mining: A Preliminary Analysis, by J.A. MacMillan, G.S. Gislason, and S. Lyon; 174 pages, 48 tables, 1977. (M-4, $12.00)

Health and Safety in the Canadian Mining Industry, by G.W. Gibbs and P. Pintus; 248 pages, 58 tables, 1978. (M-5, $12.00)

The Canadian Nonferrous Metals Industry: An Industrial Organization Study, by E. Urquhart; 158 pages, 18 tables, 1978. (M-6, $9.00)

Economic Impacts and Linkages of the Canadian Mining Industry, by P.E. Nickel, et al.; 140 pages, 31 tables, 1978. (M-7, $6.00)

Environmental Impact of Mining in Canada, by E.A. Ripley, et al., 274 pages, 45 tables, 1978, reprinted 1982. (M-8, $15.00)

Effects of Taxation on Base Metal Mining in Canada, by B.W. Mackenzie and M.L. Bilodeau; 188 pages, 29 pages, 29 tables, 1979. (M-9, $9.00)

Gold: The World Industry and Canadian Corporate Strategy, by E. Cousineau and P.R. Richardson, 192 pages, 32 tables, 1980. (M-10, $14.00)

The Impact of Policy Change on Decisions in the Mineral Industry: The Case of Exploration in Manitoba, 1969-77, by B.E. Owen and W.J. Kops, 116 pages, 8 tables, 1980. (M-11, $9.00)

The Role of Mineral Taxation in Industry/Government Conflict: The Case of the Saskatchewan Potash Reserve Tax, by David L. Anderson, 135 pages, 41 tables, 2 illustrations, 1981. (M-12, $9.00)

Profitability in the Canadian Mineral Industry, by Charles H. Pye; 178 pages, 42 tables, 12 illustrations, 1981. (M-13, $14.00)

Foreign Investment Control in the Canadian Mineral Sector: Lessons from the Australian Experience, by David L. Anderson, 180 pages, 22 tables, 1983. (M-14, $15.00)

Financing Canadian Mining in the Eighties: Strategies for Action, edited by David Yudelman; 240 pages, with papers by B. Bradly, A. Dorland, J. Erola, P. Gillin, P. Glenshaw, S. Greenwald, B. Kalymon, P. MacCulloch, B. Mackenzie, K. Murphy, A. Powis, R. Sultan, and D. Yudelman, 1984. (M-15, $15.00)

National Resources and International Bargaining Power: Canada's Mineral Policy Options, by Patrick James Caragata; 190 pages, 1984. (M-16, $20.00)

Canadian Mineral Policy Past and Present: The Ambiguous Legacy, by David Yudelman; 188 pages, 1985. (M-17, $15.00)

An Analysis of Japanese Coking Coal Procurement Policies: The Canadian and Australian Experience, by D.L. Anderson; 221 pages, 1987. (M-18, $25.00)

The Korean Mineral Market: Opportunities and Marketing Strategies for Canada, by O.Y. Kwon; 177 pages, 1987. (M-19, $15.00)

Canada and International Mineral Markets: Dependence, Instability, and Foreign Policy, by M. Webb with M. Zacher; 194 pages, 1988. (M-20, $20.00)

Pricing of Metals, by M.E. Slade, 149 pages, 1988. (M-21, $20.00)

Mining Potential in Northern and Southern Canada: Guidelines for Regional Development Policy, by B.W. Mackenzie and L.J. Verleun, 225 pages, 1988. (M-22, $20.00)

Proceedings

No. 1 *Rate-of-Return Taxation of Minerals*, edited by P.R. Richardson and N.D. Olewiler, with papers by B.W. Mackenzie and M.L. Bilodeau, P.M.T. White, N.D. Olewiler, J.T. Cawley, and E.P. Gush; 109 pages, 1978. (P-1, $9.00)

No. 2 *International Competition and the Canadian Mineral Industries*, edited by C.H. Pye and M.J. Wojciechowski, with papers by H.C. Armstrong, H.T. Fargey, C.G. Miller, N.D. Olewiler and P.R. Richardson, D. Perlstein, and K.C. Hendrick; 109 pages, 1978. (P-2, $9.00)

No. 3 *Current Concerns in Mineral Policy*, edited by B.W. Mackenzie and C.E. McMurray, with papers by C.R. Archibald, W.J. Barbour, D.B. Brooks, J.S. Dowsett, J.M. Fleming, and G.A. Jewett; 75 pages, 1978. (P-3, $5.00)

No. 4 *Canada's Mineral Trade: Implications for the Balance of Payments and Economic Development*, edited by M.J. Wojciechowski, with papers by B.W. Wilkinson, D.J. McCulla, J.G. MacKinnon, A.G. Balogh, and W.G. Chambers and J.S. Reid; 113 pages, 1978. (P-4, $9.00)

No. 5 *Employee Relations Initiatives in Canadian Mining*, edited by M.J. Wojciechowski, with papers by W.J. Bennett, F.R. Nogas and J.P. Fulcher, W.F. Clarke, S.B. Jones, T.F. Cawsey and P.R. Richardson, and P. Warrian; 85 pages, 1979. (P-5, $5.00)

No. 6 *Junior Mining in Canada: The Problem of Investment and Securing Fair Returns*, edited by M.J. Wojciechowski, with papers by A.J. Freyman, B.A. Kalymon, J.D. Mason, D.W. Scrim, E.H. Neave and P.R. Richardson, and E.G. Thompson; 101 pages, 1979. (P-6, $9.00)

No. 7 *The Future for Junior Mining in Canada, edited by M.J. Wojciechowski*, with papers by Hon. J.A.C. Auld, J.L.C. Lyndon, N.B. Keevil Jr., D.G.C. Menzel, H.T. Fargey, A.J. Freyman, Hon. R. Hnatyshyn, J.C. Baillie, D.W. Scrim, J.P. Bunting, E.H. Neave and P.R. Richardson, L.A. English, M. St.-B. Harrison, R.H. Grasley, and Hon. F. Drea; 125 pages, 1979. (P-7, $12.00)

No. 8 *Mining-Linked Diversification of the Sudbury Basin Economy*, edited by M.J. Wojciechowski, with papers by D.C. Frith, J.P. Remy, A.I. Wallace, J.H. Holtby and L.C. Kitchener, 53 pages, 1980. (P-8, $5.00)

*No. 9 *The Changing Structure of the Canadian Mineral Industry*, edited by M.J. Wojciechowski, with papers by I.A. Stewart, R.F. Mikesell, R. Simeon, R. Keyes and J.M. MacLeod; 105 pages, 1980. (P-9, $10.00)

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No. 12 *Acid Rain Controls and the Economics of the Canadian Nonferrous Mineral Industry*, edited by M.J. Wojciechowski, with papers by J. Gerin, W.G. Deeks, P.R. Clarke, J.B. Hyne, H.T. Fargey, B.W. Mackenzie, and E.J. Ward; 90 pages, 1982. (P-12, $9.00)

*No. 13 *Mineral Policy Formulation: The Role of Scientific and Technical Knowledge*, edited by M.J. Wojciechowski, with papers by G.A. Jewett, H.D. Drechsler, P.G. Halkett, D.E. Bond, D.C. Findlay, W.G. Jeffery, L.G. Bonar, D.W. Dallas, and J. Zwartendyk; 135 pages, 1982. (P-13, $12.00)

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No. 15 *Native Participation in Mineral Development Activities*, edited by M.J. Wojciechowski, with papers by A. Clark and M. Lalonde, K.A. Graham, B.W. Mackenzie, C.D. Hunt, J-L. Blais, F.R. Joubin, E. Laliberte; 150 pages, 1984. (P-15, $10.00)

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No. 20 *Long-Term Prospects for Gold Mining*, edited by B.W. Mackenzie and R. Gesing, with papers by J. Nichols, T. Green, J. Fisher, M. Murenbeeld, G. Anders, R. Woodall, D. Krige, D. Cranstone, B. Mackenzie, M. Doggett, B. Kalymon, C. Margueron, M.J. Wojciechowski, and K. Buck, 233 pages, 1987. (M-20, $15.00)

Working Papers

*No. 1 *An Analysis of the Recent Federal Tax Changes Affecting the Canadian Mining Industry*, by Jean-Thomas Bernard; 27 pages, 6 tables, 1977.

*No. 2 *Risk and Return in the Canadian Mining Industry*, by A.M. Rugman; 31 pages, 10 tables, 1977.

*No. 3 *Provincial Mineral Policies: Newfoundland, 1949-75*, by M.J. Prince; 67 pages, 7 tables, 1977.

*No. 4 *Provincial Mineral Policies: Quebec 1945-75*, by S. Guindon; 49 pages, 1 table, 1977.

*No. 5 *Provincial Mineral Policies: Ontario 1945-75*, by R. Hynes; 48 pages, 4 tables, 1978.

*No. 6 *Provincial Mineral Policies: Saskatchewan, 1945-75*, by R.C. Murray; 64 pages, 1978.

*No. 7 *Provincial Mineral Policies: New Brunswick, Nova Scotia 1945-77*, by A. Koven; 37 pages, 1978.

No. 8 *Federal Mineral Policies: 1945-75*, by M.J. Wojciechowski; 85 pages, 21 tables, 1979. (WP-8, $5.00)

No. 9 *Trends in Canada's Mineral Trade*, by B.W. Wilkinson; 63 pages, 27 tables, 1978. (WP-9, $5.00)

No. 10 *Canada as a World Zinc Producer: Prospects to 1980*, by N.D. Olewiler, P.R. Richardson, and L. Rumble, 22 pages, 12 tables, 1978. (WP-10, $5.00)

*No. 11 *A Survey of Resources and a Production Cycle for the Non-ferrous Metals*, by C. Lafkas and J.G. Paterson; 44 pages, 9 tables, 1978.

*No. 12 *Solar Energy and the Canadian Mining Sector: A Demand Forecast*, by J.S. Shewchun and D.B. Curtis, 45 pages, 14 tables, 1978. (WP-12, $5.00)

No. 13 *Cerro Colorado: A Case Study of the Role of Canadian Crown Corporations in Foreign Mineral Development*, by C.G. Miller, N.D. Olewiler, and P.R. Richardson, 44 pages, 5 tables, 1979. (WP-13, $5.00)

*No. 14 *The Administration of Mineral Exploration in the Yukon and Northwest Territories*, by K.A. Graham, R.G. McEachern and C.G. Miller; 42 pages, 1979. (WP-14, $5.00)

No. 15 *Public Policy Aspects of Information Exchange in Canadian Mineral Exploration*, by D.O. Downing and B.W. Mackenzie, 52 pages, 1979. (WP-15, $5.00)

No. 16 *Canada's Competitive Position in Copper and Zinc Markets*, by B.W. Mackenzie; 41 pages, 21 tables, 1979. (WP-16, $5.00)

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No. 18 *An Economic Analysis of the Canadian Taxation of an Integrated Mining Company*, by Jean-Thomas Bernard; 112 pages, 1980. (WP-18, $9.00)

*No. 19 *Looking for the Improbable Needle in a Haystack: The Economics of Base Metal Exploration in Canada*, by B.W. Mackenzie, 48 pages, 1980. (WP-19, $5.00)

No. 20 *The Market Price of Risk in the Canadian Mining Industry*, by H.F. Campbell, 29 pages, 1980. (WP-20, $5.00)

No. 21 *Public Affairs and the Minerals Industry: Junior Mining; Northern Development, Loans for Foreign Mines, A Public Relations Strategy*, by C.G. Miller; 42 pages, 1980. (WP-21, $5.00)

No. 22 *Newfoundland Mining Industry: Present Status and Potential for Expansion*, by N.D. Olewiler and C.H. Pye, 208 pages, 83 tables, 1980. (WP-22, $14.00)

No. 23 *Effects of Water Pollution Control Costs on Base Metal Mining in Canada*, by N.A. Papanicolaou and B.W. Mackenzie; 74 pages, 1981. (WP-23, $6.00)

No. 24 *The Costs of Uncertainty: Regulating Health and Safety in the Canadian Uranium Industry*, by I. Robinson, 74 pages, 3 illustrations, 1982. (WP-24, $9.00)

No. 25 *Economic Guidelines for Small Mineral Deposits/Directives économiques relatives aux petits gisements*, by B.W. Mackenzie and M.L. Bilodeau; 66 pages, 12 tables, 14 illustrations, 1982. (WP-25, $7.00)

No. 26 *Effects of Public Policy on Investment Demand: The Case of Taxation in Canadian Base Metal Mining*, by B.W. Mackenzie and C.H. Pye; 58 pages, 17 tables, 11 illustrations, 1982. (WP-26, $7.00)

*No. 27 *The Prospects for Canadian Uranium*, by S. Salaff; 50 pages, 9 tables, 1983. (WP-27, $7.00)

No. 28 *Economic Mineral Exploration Targets*, by B.W. Mackenzie; 72 pages, 3 tables, 19 illustration, 1984. (WP-28, $7.00)

No. 29 *Dominant Government Firms in an Oligopolistic Industry: The Case of Saskatchewan Potash*, by F. Flatters and N. Olewiler; 43 pages, 3 tables, 1984. (WP-29, $5.00)

No. 30 *Canadian Mineral Policy Formulation: A Case Study of the Adversarial Process*, by David Yudelman, 83 pages, 1984. (WP-30, $6.00)

No. 31 *Federal Policy and the Role of the Public Enterprise in the Mining Sector*, by M.J. Prince and G.B. Doern, 52 pages, 1984. (WP-31, $5.00)

No. 32 *Productivity and Price: The Case of Gold in Ontario*, by A.G. Green, 54 pages, 1984. (WP-32, $5.00)

No. 33 *The Origins of Public Enterprise in the Canadian Mineral Sector: Three Provincial Case Studies*, by M.J. Prince and G.B. Doern, 143 pages, 1984. (WP-33, $14.00)

No. 34 *Mining and the Macdonald Commission: The State of the Industry in the Mid-1980s*, by D. Yudelman, 116 pages, 1985. (WP-34, $12.00)

No. 35 *Effects of Location on the Competitive Position of Mineral Exploration and Development in Canada*, by B.W. Mackenzie, D.W. Davis and M.L. Bilodeau, 88 pages, 1986. (WP-35, $8.00)

No. 36 *Mine Infrastructure and Economic Development in North Australia*, by C. O'Faircheallaigh, 104 pages, 1986. (WP-36, $12.00)

No. 37 *Intergovernmental Mineral Commodity Arrangements*, by W.K. Buck, 70 pages, 1986. (WP-37, $8.00)

No. 38 *Value-Added Taxation: Issues and Impact for Canadian Mines*, by B.J. Dyack, 62 pages, 1986. (WP-38, $7.00)

No. 39 *Flow-Through Share Financing*, by B. Kalymon, 63 pages, 1987. (WP-39, $7.00)

No. 40 *Mineral Exploration Economics: The Search for Base Metals in Australia and Canada*, by B.W. Mackenzie and R. Woodall, 112 pages, 1987. (WP-40, $12.00)

No. 41 *Economic Trends in Canadian Gold Supply*, by B.W. Mackenzie and M. Doggett, 80 pages, 1987. (WP-41, $7.00)

No. 42 *The Changing Transportation Environment of the Canadian Mineral Industry*, by I. Wallace, 37 pages, 1987. (WP-42, $5.00)

Discussion Papers

Discussion papers are a special series of short papers with limited distribution commenting on current issues in mineral resource policy. They represent the result of independent research sponsored by CRS and are offered for information and discussion, and represent an attempt to encourage feedback and further research.

**Effects of the November 16, 1978 Budget on Base Metal Mining in Canada: A Challenge for the Provinces and Some Future Concerns*, by Brian W. Mackenzie and Michel L. Bilodeau

**Effects of Recent Mining Taxation Changes in Quebec, Ontario, and Manitoba*, by Brian W. Mackenzie and Michel L. Bilodeau

**Financing of Junior Mining in Canada*, Summary of the Fifth CRS Policy Discussion Seminar, March 28-30, 1979

**New Mining Ventures: The Case for Preserving After-Tax Financing*, by William T. Cannon

**The Proposed Ontario Aggregates Act: Discussion, Evaluation and Recommendations*, by John Swaigen and J.F. Castrilli

**Parametres Economiques de l'Exploration Minerale au Quebec: Vers la Planification et l'Elaboration d'une Politique Minerale*, par M.L. Bilodeau et B.W. Mackenzie

**Effects of Sulphur Dioxide Control Costs on the Canadian Base Metal Mining Sector: A Preliminary Analysis*, by Brian W. Mackenzie

**The Law of the Sea and Canada's Mineral Industry*, by J. Owen Saunders

Technical Papers

*No. 1 *Financing and Stabilization Policies in a Cyclical Industry: The Case of Inco in the Seventies*, by W.T. Cannon; 200 pages, 33 tables, 12 illustrations, 1981. (T-1, $15.00)

No. 2 *Economic Effects of Smelter Controls on the Canadian Nonferrous Mining Industry*, by B.W. Mackenzie and M.L. Bilodeau; 162 pages, 44 tables, 16 illustrations, 1982. (T-2, $15.00)

No. 3 *Secondary Supply of Copper and Ferrous Metals and Canadian Metal Markets*, by K. Stollery; 118 pages, 24 tables, 16 illustrations, 1983. (T-3, $15.00)

No. 4 *Mineral Technology Transfer. Evaluation of the CANMET Pit Slope Project*, by B.W. Mackenzie and R. Pakalnis; 220 pages, 20 tables, 17 illustrations, 1985. (T-4, $20.00)

*No. 5 *Sourcebook for Native Participation in Canadian Mineral Activities*, by M.J. Wojciechowski and K.A. Graham; 165 pages, 1985. (T-5, Free)

No. 6 *Geological Aspects of Mining Productivity: Canada's Base Metal Resources*, by B.W. Mackenzie; 115 pages, 19 tables, 11 illustrations, 1985. (T-6, $10.00)

No. 7 *Innovation in the Mineral Industry: Opportunities and Strategies for Canada*, by M.J. Wojciechowski and P.R. Richardson, 278 pages, 1987. (T-7, $27.00)

No. 8 *An Inter-Sectoral Study of Canada's Resource Industries*, by T. Bennett and D.L. Anderson, 197 pages, 1988. (T-8, $20.00)

Mineral Policy Update

Mineral Policy Update 1981, by M.J. Wojciechowski and C.E. McMurray; 85 pages, 1983. (U-81, $7.00)

Mineral Policy Update 1982, by M.J. Wojciechowski and C.E. McMurray; 88 pages, 1983. (U-82, $7.00)

Mineral Policy Update 1983, by M.J. Wojciechowski; 88 pages, 1984. (U-83, $8.00)

Mineral Policy Update 1984, by M.J. Wojciechowski; 117 pages, 1985. (U-84, $12.00)

Eastern Arctic Study

The Inuit Land Claim, Constitutional Development, and Local Government Reform in the Northwest Territories: An Overview, by Katherine A. Graham and Anne B. McAllister, 50 pages, 1981. (EAS-1, $5.00)

**Industrial Development in the Eastern Arctic Study Area: A Preliminary Overview*, by C. George Miller, 31 pages, 1981. (EAS-2, $5.00)

**Eastern Arctic Study Case Study Series: The Alaska Native Claims Settlement*, by David Baker, 100 pages, 1982. (EAS-4, $5.00)

Eastern Arctic Study Case Study Series: Mineral Exploration in the Baker Lake Area, by Anne B. McAllister, 58 pages, 1982. (EAS-5, $5.00)

**Eastern Arctic Study Case Study Series. The Development of the Polaris Mine*, by Katherine A. Graham, 61 pages, 1982. (EAS-6, $5.00)

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